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REGION 3 DWARFMISTLETOE SURVEY: PROGRESS
REPORT OF THE 1954-55 FIELD WORK

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SUMMARY

Two Indian Reservations and 11 ranger districts on 5 national forests have been covered by the Regional Dwarfmistletoe Survey which was begun in 1954 and is now estimated to be 20 percent completed. The plan of the survey is twofold: (1) a roadside reconnaissance to determine the incidence of infection and (2) line plots to obtain detailed information on volumes, mortality, and pole populations.

Observations along roadsides through 1,100 miles of commercial forests have been recorded. Ponderosa pine stands made up about 90 percent of the area covered to date; the remaining areas were in Douglas-fir, white fir, and spruce stands. Dwarfmistletoe was found in 41 percent of all ponderosa pine stands surveyed: 23 percent in northern New Mexico, 54 percent on the Mescalero Reservation, and 51 percent in the Arizona forests covered in 1954. The incidence of dwarfmistletoe in all Douglas-fir stands surveyed is 48 percent. In addition to the roadside observations, 424 one-quarter acre plots were established in representative stands. The results from the 1955 field work confirm previous survey findings indicating that mortality in ponderosa pine is directly associated with intensity of dwarfmistletoe. Mortality in merchantable-sized ponderosa pine is 3.6 times as heavy in dwarfmistletoe-infected as in uninfected stands. The proportion of trees of poor vigor was twice as high in infected as in dwarfmistletoe-free trees.

INTRODUCTION

Dwarfmistletoes attack all commercially important conifers in the Southwest^{1/} and are the cause of the most important diseases of ponderosa pine and Douglas-fir.

Information on the biology and control of ponderosa pine dwarfmistletoe is contained in a recent Rocky Mountain Forest and Range Experiment Station publication^{2/}. Although dwarfmistletoes have been known to be widespread and damaging in the Southwest for some time, the present survey is the first attempt to evaluate dwarfmistletoe damage and loss on a regional basis. The survey was begun in 1954 and the first-year results were given in a Progress Report^{3/}.

The Bureau of Indian Affairs and the Southwestern Region of Forest Service have been very helpful in providing quarters for the field crews and in supplying detailed information on the road systems and timber stands on the reservations and ranger districts surveyed.

^{1/} Ponderosa pine and Douglas-fir, which comprise over 90 percent of the sawtimber volume in Arizona and New Mexico, are each attacked by a distinct species of dwarfmistletoe: Arceuthobium vaginatum f. cryptopodum on ponderosa pine and A. douglasii on Douglas fir. The species on Engelmann and blue spruce is A. campylopodum f. microcarpum. The true firs (Abies) are attacked by A. campylopodum f. abietinum although this parasite has not been seen in the areas surveyed to date.

^{2/} Gill, L. S. Dwarfmistletoe of ponderosa pine in the Southwest. Rocky Mountain For. and Range Expt. Sta. Station Paper No. 14, 9 pp. 1954.

^{3/} Region 3 Dwarfmistletoe Survey: Progress Report of 1954 Field Work. By F. G. Hawksworth and S. R. Andrews. Rocky Mountain Forest and Range Experiment Station Mimeo. Report. 5 pp. May 26, 1955.

The plan of the survey is twofold: (1) A roadside reconnaissance to obtain general information on areas infected and mortality and (2) line plots to obtain detailed information on mortality, infection, and volumes in merchantable trees and extent of dwarfmistletoe in sub-merchantable size classes. Details on the survey methods are given in Appendix II.

RESULTS

An estimated 20 percent of the forest area in the Region has been covered to date (Figure 1). A total of 1,099.7 miles has been traversed in the roadside reconnaissance; the breakdown by forest types is given in Table 1. The proportion of each forest type infected is ponderosa pine--41 percent, Douglas-fir--48 percent, and spruce--16 percent. Dwarf-mistletoe was not found in the small portion of the area where white fir was the predominant species. A test of the roadside reconnaissance technique used in the survey, which was made on the Mescalero Reservation in 1955, indicated that the information obtained by this method is comparable with results from more intensive surveys (Appendix I).

Table 1.--Summary of roadside reconnaissance in all commercial forest types during 1954 and 1955

Forest Type	Total Sample		Dwarfmistletoe-infected Stands	
	Distance	Proportion	Distance	Proportion
	traveled	in each type	Totals	of each type
	(miles)	(percent)	(miles)	(percent)
Ponderosa pine	987.10	89.8	408.35	41
Douglas-fir	83.25	7.6	39.75	48
Spruce	22.70	2.0	¹ / ₃ .70	16
White fir	6.65	0.6	--	0
Totals	1,099.70	100.0	--	--

¹/₃ Spruce dwarfmistletoe was not seen in the New Mexico localities covered to date, but it is very common and damaging in the spruce stands on the Alpine District of the Apache National Forest, Arizona.

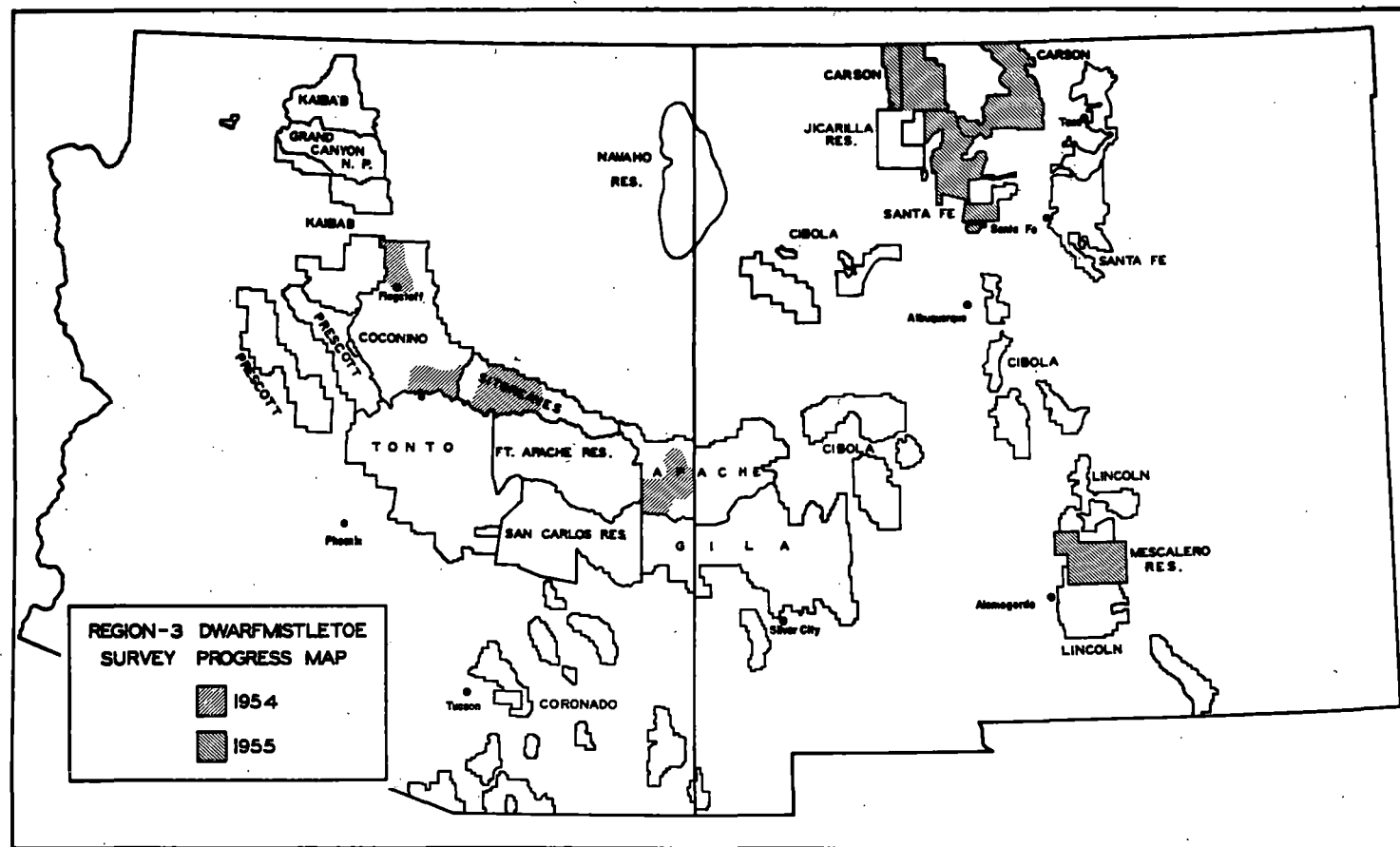


Figure 1.--Dwarf mistletoe Survey Progress Map showing areas covered in 1954 and 1955. In the case of the Navajo Reservation only the forested portions are shown, while in all other reservations and national forests the actual boundaries are indicated.

Table 2.--Incidence of dwarfmistletoe in the ponderosa pine type
(from roadside reconnaissance)

Location	Date of: survey (year)	Basis (miles)	Dwarfmistletoe- infected stands (percent)
Santa Fe N.F., Jemez R.D.	1955	92.25	27
" " " , Cuba R.D.	1955	53.55	23
" " " , Coyote R.D.	1955	48.50	21
" " " Totals	1955	194.30	25
Carson N. F., El Rito R.D.	1955	55.80	24
" " , Tres Piedras R.D.	1955	19.35	22
" " , Canjilon R.D.	1955	18.90	26
" " , Jicarilla R.D.	1955	30.45	20
" " Totals	1955	124.50	23
Jicarilla Indian Reservation	1955	40.70	18
Subtotals, Northern New Mexico	1955	359.50	23
Mescalero Indian Reservation	1955	106.15	54
Sitgreaves N.F., Heber R.D.	1954	143.60	50
Coconino N.F., Block 1	1954	89.20	37
" " , Blocks 6 and 7	1954	148.70	64
Apache N.F., Alpine R.D.	1954	139.95	47
Subtotals, Arizona	1954	521.45	51
All areas surveyed	1954 + 1955	987.10	41

Table 3.--Intensity of dwarfmistletoe in the ponderosa pine type as determined by the roadside reconnaissance

Area	Dwarfmistletoe Intensity ^{1/}				
	Basis:	Light	Moderate	Heavy	Totals
	(miles)	(pct.)	(pct.)	(pct.)	(pct.)
Northern New Mexico	: 359.50	9	5	9	23
Mescalero - Southern N. Mex.	: 106.15	14	14	26	54
Arizona	: 521.45	11	15	25	51
Totals	: 987.10	11	11	19	41

^{1/}Light: Less than one-third of trees in predominant size class infected.
Moderate: 1/2 to 2/3 of trees in predominant size class infected.
Heavy: Over two-thirds of trees in predominant size class infected.

Ninety percent of the stands covered to date have been in the ponderosa pine type (Table 1). The incidence of infection in this type was 23 percent in the northern New Mexico forests covered by the survey as compared with 54 percent on the Mescalero Reservation in southern New Mexico and 51 percent in the Arizona forests surveyed in 1954 (Table 2). Table 3 gives the intensity of dwarfmistletoe in the three localities. In Arizona and on the Mescalero Reservation the areas of heavy infection account for about one-half the infected acreage or approximately one-fourth of the ponderosa pine type. In northern New Mexico 9 percent of the ponderosa pine stands surveyed were heavily infected.

The results for the area covered to date show little difference in the incidence of ponderosa pine dwarfmistletoe in virgin (44 percent) and cutover stands (40 percent).

A total of 424 one-quarter acre plots were established in ponderosa pine stands during the survey. Percentage mortality (dead, standing trees with bark intact as percent of living plus dead volume) in infected stands was 3.6 times that in mistletoe-free stands. Mortality was considerably higher in virgin than in cutover stands (Figure 2). Some indication of future mortality may be obtained from Figure 3 which shows that the proportion of poor vigor trees is twice as high in dwarfmistletoe-infected as in uninfected ponderosa pine.

Mortality in submerchantable size classes is relatively light although it is higher in dwarfmistletoe-infected stands (Figure 4). In large poles (trees 7.6 to 11.5 inches d.b.h.) it was more than twice as high in infected stands.

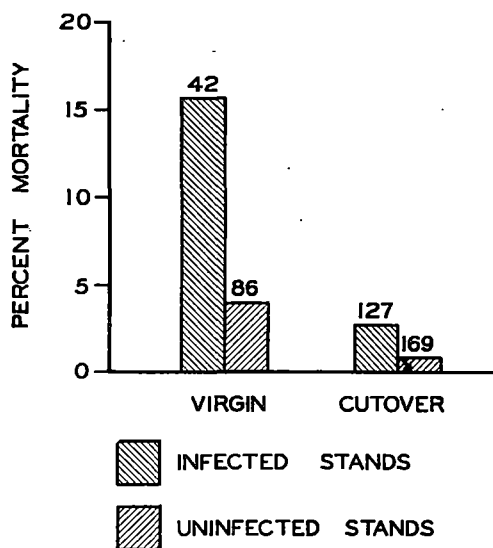


Figure 2.--Bar graph showing mortality (dead volume as a proportion of the total volume--living plus dead) in dwarfmistletoe-infected and uninfected virgin and cutover stands. The number above each bar indicates the plot basis (combined data for all areas surveyed).

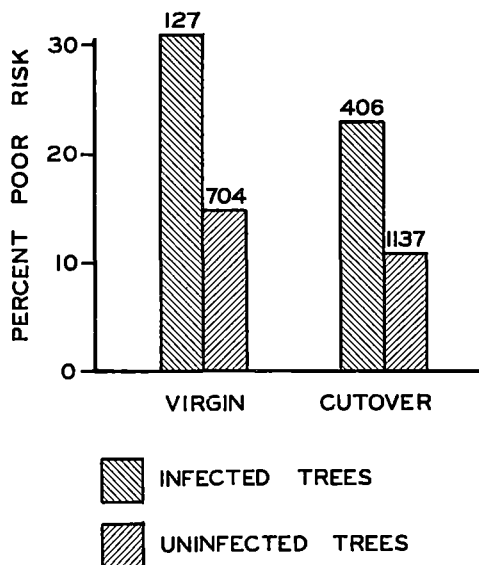


Figure 3.--Bar graph showing the proportion of ponderosa pine volume in trees classed as poor risk. The number above each bar refers to the tree basis (combined data from line plots in all areas surveyed).

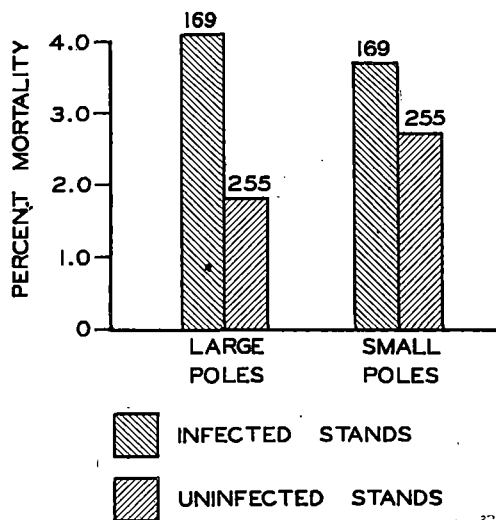


Figure 4.--Bar graph showing mortality (dead standing trees as percent of living plus dead) in ponderosa pine pole stands. The number above each bar indicates the plot basis (combined data from all areas surveyed).

FUTURE PLANS

The 1956 field work on the dwarfmistletoe survey will be carried out at an increased rate since the number of summer assistants this year will be more than twice that of previous years. Final selections of the areas to be covered during 1956 have not yet been made, although the tentative plan is to survey the Kaibab National Forest in northern Arizona, the Gila National Forest in southwestern New Mexico, and the Navajo Indian Reservation in northeastern Arizona and northwestern New Mexico.

APPENDIX I

Test of the Accuracy of Roadside Reconnaissance Data

A roadside reconnaissance of the commercial forests on the Mescalero Indian Reservation, New Mexico, was made in 1955. The purpose of this test was to compare the dwarfmistletoe incidence figures obtained by this method with the incidence data from an intensive survey of the area in 1952-53. The roadside reconnaissance data are based on 135 miles of roadside observations while the intensive survey data are based on over 3,100 plots placed at random points (at the rate of 6 per linear mile) along lines which were run at $\frac{1}{2}$ -mile intervals through the area. Statistical analysis of the intensive survey data indicated that these are within 5 percent (odds of 19 out of 20) of the results which would be expected from a 100 percent sample. The table below shows that the incidence data from the roadside reconnaissance are within 4 to 6 percent of those from the intensive survey.

Forest Type	Incidence of Dwarfmistletoe		Accuracy ^{1/} (percent)
	Intensive :	Roadside	
	survey of : 1952-53 : (percent)	reconnaissance 1955 (percent)	
Ponderosa pine	52	54	4
Douglas-fir	34	36	6

^{1/} Difference between the two results as a percent of the Intensive Survey figures.

APPENDIX II

Details on the methods used in the survey:

Roadside Reconnaissance

The primary purpose of the roadside reconnaissance is to determine incidence of dwarfmistletoes on various species, forest types, size classes, sites, and ages of cuttings, but information on mortality is also obtained. As many roads as possible are traversed in the time allotted for each district. The roads are traveled slowly (approximately 10 miles per hour) and the following factors recorded in a chain-wide strip along the right hand side of the road:

1. Stand condition: Virgin, old cutover (over 15 years) or recent cutover (cut within last 15 years).
2. Species: Predominant commercial species and associated species.
3. Size classes: Mature, large poles, small poles, or saplings.
4. Topographic position: Bottom, slope, or ridge.
5. Abundance of dwarfmistletoes: Light, moderate, or heavy (Table 3).
6. Mortality: Counts of dead standing merchantable-sized trees with bark intact were made.

Speedometer readings are noted and distances recorded to the nearest one-twentieth of a mile whenever a change in any of the first 5 factors is observed.

Line Plots

The primary purpose of the line plots is to obtain detailed information on volumes, mortality, and pole populations in dwarfmistletoe-infected and uninfected stands. Strips with 6 one-quarter acre circular plots per linear mile are run through representative stands previously sampled by the roadside survey. The plots are spaced at random intervals along the line; usually two lines are run one-fourth mile apart in each area. The plot size for merchantable trees is one-quarter-acre on which the species, d.b.h., log height, vigor^{1/} (for ponderosa pine only), and

^{1/}Rated as either good or poor depending on crown density and color.

degree of dwarfmistletoe^{2/} are recorded for each merchantable tree. Dead standing merchantable-sized trees with bark intact are recorded and presence or absence of dwarfmistletoe noted. The submerchantable-sized trees are tallied on a one-tenth-acre plot concentric with the quarter-acre plot for merchantable trees. The number of trees of large and small pole sizes^{3/} are recorded by species and presence or absence of dwarfmistletoe noted. Dead standing poles are also tallied.

^{2/} Each infected merchantable tree is given a rating of one of six degrees of dwarfmistletoe infection determined by classifying each one-third of the crown as either 1 (light dwarfmistletoe) or 2 (heavy dwarfmistletoe) and adding the three figures, e.g., 6 = entire tree heavy. This rating system is used for all tree species.

^{3/} Large poles: 7.6 to 11.5 inches d.b.h.
Small poles: 6 feet high to 7.5 inches d.b.h.